DOCUMENT RESUME

ED 412 907 IR 018 556

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TITLE	The Launching Pad: Delivering Information Competence through the Web.
PUB DATE	1997-00-00
NOTE	11p.; Paper presented at "The Universe at Your Fingertips: Continuing Web Education." Conference Sponsored by the Librarians Association of the University of California, Santa Barbara, Friends of the UCSB Library, and the Black Gold Cooperative Library System Reference Committee (Santa Barbara, CA, April 25, 1997). For papers from the proceedings of this conference, downloaded and printed out from the UCSB Web site, see IR 018 545-561.
AVAILABLE FROM	Electronic version: http://www.library.ucsb.edu/universe/clay.html
PUB TYPE	Reports - Evaluative (142) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Academic Libraries; Computer Graphics; Computer Software; *Computer Uses in Education; Educational Innovation; Higher Education; *Information Skills; Internet; Librarians; Library Instruction; Microcomputers; *Multimedia Instruction; Multimedia Materials; *Online Systems; *World Wide Web
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ABSTRACT

Traditionally, librarians have used printed workbooks to teach students basic information skills. With the emergence of the World Wide Web, opportunities are available to transform these static and linear tools into dynamic, interactive instructional resources. This paper describes the efforts of librarians at California Polytechnic State University to create interactive Web-based modules to teach information competence. The electronic workbook utilizes split screen technologies and places heavy emphasis on the use of graphics, images, sample pages, excerpts from full-text sources, citations, and other relevant materials to provide a realistic learning environment. The electronic workbook allows students to view instructional tips, examples and exercises, and simultaneously record answers on an electronic assignment sheet. The paper provides information on: background and overview of the project; the project team; delivering information competence through the Web; the step-by-step process involved in creating the Web-based tutorials; and hardware and software used in developing the tutorials. Steps in the development process were: (1) determining a list of core competencies; (2) determining the content for each tutorial; (3) developing tutorials as a wordprocessed "storyboard" document (instruction and workbook); and (4) mounting the tutorials on the web. Advantages and disadvantages of Web-based instruction are also discussed. (Author/SWC)

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ED 412 907

The Universe at Your Fingertips: Continuing Web Education

April 25, 1997 · University Center · University of California, Santa Barbara

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Abstract

THE LAUNCHING PAD:
DELIVERING INFORMATION COMPETENCE THROUGH THE WEB

Traditionally, librarians have used printed workbooks to teach students basic information skills. With the emergence of the world wide web, opportunities are now available to transform these static and linear tools into dynamic, interactive instructional resources. This presentation will describe our efforts to create interactive WWW-based modules to teach information competence.

These modules, to be used in library credit courses and college-based courses throughout the general curriculum, are part of a CSU multi-campus project which arose out of a system-wide Information Competence Workshop held in December 1995. Our presentation will provide an overview of the project and will describe the process of creating interactive instructional Web tutorials based on 10 core information competencies.

The focus of the presentation will be a discussion and demonstration of the interactive WWW-based electronic workbook. We will show how the workbook utilizes split screen technologies and places heavy emphasis on the use of graphics, images, sample pages, excerpts from full-text sources, citations, and other relevant materials to provide a realistic learning environment. The electronic workbook allows students to view instructional tips, examples and exercises, and simultaneously record answers on an electronic assignment sheet. Issues, problems, and constraints related to the content, design, and testing of the workbook will be reviewed.

This presentation will be of interest to librarians engaged in library instruction, the web as

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an instructional medium, and information competence.

INTRODUCTION

In keeping with the conference theme of making the best use of the Web, the focus of this presentation will be on the development of a self-paced course on the Web. We will discuss and point to examples of the interactive instructional modules that are being developed. We hope to show how we have incorporated split screen technologies and visually pleasing graphics to illustrate and demonstrate information competence concepts. The presentation will describe the process of creating these modules, discussing the content and design of the tutorials. We will also discuss some of the issues, problems, and constraints we encountered in transferring content and design onto the Web. But first, some background information will be given to place this presentation in context.

BACKGROUND

As information proliferates and technology becomes more sophisticated, it is imperative that a person be "information competent" i.e. be able to find, evaluate, use, and communicate information efficiently and effectively. Almost all academic institutions and libraries recognize the need to incorporate information competence into the core curriculum and into library instruction.

At the California State University (CSU) libraries, this need was formalized in the document Transforming CSU Libraries for the 21st Century: a Strategic Plan of the CSU Council of Library Directors issued in September 1994. Under instructional goals, key strategies included determining basic information competence levels and providing instructional modules or courses for information competence.

Following this, a Work Group on Information Competence was formed to explore the issues of information competence and to recommend levels of competencies required of students. In its December 1995 report, Information Competence in the CSU: A Report, a set of core competencies was suggested. The competencies are as follows:

1. State a research question, problem or issue
2. Determine the information requirements for the research question, problem or issue
3. Locate and retrieve relevant information
4. Organize information
5. Analyze and evaluate information
6. Synthesize information
7. Communicate using a variety of information technologies
8. Use the technological tools for accessing information
9. Understand the ethical, legal and socio-political issues surrounding information and information technology
10. Use, evaluate and treat critically information received from the mass media
11. Appreciate that the skills gained in information competence enable lifelong learning

OVERVIEW OF THE PROJECT

These 2 reports spurred our intrepid Head of Reference, Mr. Paul Adalian, to submit a grant proposal to the Commission on Learning Resources and Instructional Technology (CLIRT). The proposal, Information Competence Implementation Through Interactive Instructional Materials: A Systemwide Collaboration, was funded July 1996. Although initiated by Cal Poly San Luis Obispo, the projects outlined in the proposal include collaboration with the libraries at Cal Poly Pomona, CSU Monterey Bay, CSU Fullerton and CSU Los Angeles.

The proposal outlines an ambitious effort to infuse information competence into the curriculum. The goal of this multi-campus project is to develop interactive instructional materials that will facilitate the teaching and learning of information competence. Based on the list of core competencies identified by the Work Group, the objectives of the project include:

- creation of an Information Competence Course (Cal Poly San Luis Obispo)
- development of a self-paced course on the Web
- development of classroom presentations using Macromedia Director
- identification of discipline-specific information competencies
- integration of the course into discipline-related instructional efforts

To find out more about the proposal and the individual components outlined above, visit our project home page. [http://www.lib.calpoly.edu/infocomp]

THE PROJECT TEAM

The overall project is headed by the Project Manager, Paul Adalian. The development team for the Web-based instructional modules consists of 2 librarians and 1 multimedia specialist. The librarians and multimedia specialist do have other areas of responsibilities as well, and at times, it has been a real effort to keep to the project's timeline. However, the grant did provide for 1 part-time clerical assistant who assists in gathering and scanning the books, articles, images needed, and 1 part-time student who assists in creating the programs needed for the interactive sections. The 2 librarians are responsible for the conceptual framework and basic content of the modules i.e. what materials are to be included in the instructional and workbook sections of the tutorials. The multimedia specialist and her support staff are responsible for mounting the tutorials on the Web. It must be noted, however, that these two areas of responsibility (content development and Web implementation) are not mutually exclusive. The librarians and multimedia staff work interdependently, continually communicating and collaborating with one another. This process of constant consultation, revision, and negotiation will be discussed in greater detail later in this presentation.

DELIVERING INFORMATION COMPETENCE THROUGH THE WEB

As mentioned above, this presentation focuses on the development of a self-paced course on the Web, one of the 5 objectives listed in the overall project. Traditionally, librarians have used printed workbooks to teach students basic information skills. With the emergence of the world wide web, opportunities are now available to transform these static and linear tools into dynamic, interactive instructional resources

The goal of using the Web to deliver our instructional modules is to create instructional modules that will simulate a realistic learning environment and visually appeal to today's users who are more oriented toward interactive multimedia than text. In accomplishing this goal, 2 phrases come to mind: "A picture's worth a thousand words" and "Critical thinking and active learning".

With this in mind, the following objectives were formulated. Graphics, images, sample pages, excerpts from full-text sources, citations, and other relevant materials will be utilized to illustrate and demonstrate information competence concepts, skills and strategies. Using split-screen technologies, students will be engaged in interactive instructional and practice sessions. The electronic workbook part of the tutorial will include quizzes and assignments which reinforce and test acquired skills, knowledge and comprehension.

As can be seen, we set ourselves some very challenging and formidable tasks!

DEVELOPING THE WEB-BASED MODULES

This section describes the step-by-step process we followed in creating Web-based instructional tutorials, the problems we encountered and the lessons we learned. It should be noted that the Web tutorials detailed in this section are not yet completed; they are still being developed. Therefore, what is depicted here is a project "in progress".

STEPS IN THE PROCESS

The process of developing the Web-based instructional modules involved the following activities:

1. Determining a list of core competencies to be covered
2. Determining the content of each competency tutorial
3. Developing the tutorials as a wordprocessed "storyboard" document
4. Mounting the tutorials on the Web
5. Incorporating feedback from other CSU librarians
6. Beta testing (still to be done)

Though the development of our Web instruction modules is depicted as a linear one - a series of successive steps - this is somewhat misleading. Rather, the creation of the Web-based instructional modules has been more of a circular process, one which has involved a great deal of trial and error, seeing what worked and then revising (sometimes many times), or even discarding parts which were already "completed".

This process of continual revision (the proverbial two steps forward, one step back) has occurred for many reasons. Frequently when we, the librarians in charge of content, handed our content "storyboard" to the multimedia staff, problems arose in translating our vision into a viable Web document and changes were required. (These problems will be detailed later in the presentation.) Or, in some cases, we came across somebody else's Web tutorial which gave us ideas that we wanted to incorporate in already completed modules. Again we had to go back and revise those sections. At other times the multimedia staff made suggestions for better or more interesting ways to implement or

illustrate instructional techniques. Finally, because we continually sought the feedback of other librarians collaborating on the project, when we received suggestions, we sometimes had to rethink and modify our work.

STEP 1: DETERMINING A LIST OF CORE COMPETENCIES

We derived the list of core competencies that we wanted to cover from those competencies outlined previously in the CSU Information Competence Work Group Report. However, because we felt that some of the Work Group's competencies were not easily transferable to Web-based instruction, we made some modifications. For example, the Work Group's final competence was "Appreciate that the skills gained in information competence enable lifelong learning". We changed this to "Judge the product and the process". We decided that in a self-paced Web environment it would be more viable to suggest methods of reviewing and assessing an experience rather than to teach values and attitudes. The list of 10 core competencies which we decided upon for this project can be viewed at our Information Competence Web Site.
[http://www.lib.calpoly.edu/infocomp/modules/index.html]

STEP 2: DETERMINING THE CONTENT FOR EACH TUTORIAL

After we decided on the list of 10 competencies, we looked at each competency on the list and "brainstormed" for ideas on what content and practice material might be included in a Web tutorial. To get ideas we scavenged, borrowed and begged. We searched for already established Web sites on information literacy instruction; we perused traditional print library instruction handbooks; we called upon our own and our colleagues' experiences teaching students bibliographic concepts and answering questions at the reference desk. For those competencies not traditionally within the librarian's area of expertise (media literacy, communication of information), we conducted literature searches and sought input from knowledgeable faculty and staff.

Once we determined the possible content for each tutorial, we created a module outline. We synthesized and organized our "brainstorming" material and put it in a logical sequence. The outlines of all the tutorials were then mounted on the project Web site, giving librarians at participating institutions an opportunity to provide feedback and suggestions. [http://www.lib.calpoly.edu/infocomp/project/outline.html]

STEP 3: DEVELOPING TUTORIALS (INSTRUCTION & WORKBOOK)

Using the module outlines as a guideline, we began developing the tutorials for each competency. The tutorials included both instructional and workbook sections. We first created the instructional section which incorporated various strategies for teaching skills itemized in the module outline. Once we completed the instructional section, we developed the workbook. The workbook included exercises which reinforced concepts and strategies taught in the instructional section, gave the user a chance to practice those strategies, and allowed the user to assess his/her understanding of the material covered.

The instructional and workbook sessions were created as a wordprocessed document in the form of a "storyboard", i.e., each printed page represented a web screen. The page included instructional text (and/or practical exercises) as well as suggestions for: graphics to illustrate the text; page layout, including the use of frames, placement of text, graphics, etc.; and directions for navigating between screens or via hypertext links.

As mentioned earlier, the challenge was to produce tutorials which were realistic (simulations of real-life educational experiences), interactive (requiring the user to make choices and actively engage in the learning process) and visually interesting (as opposed to the dull text of printed workbooks). We incorporated teaching techniques which took advantage of the Web as an instructional medium. Split screen technology (frames) provided users with opportunities to engage in "live instructional sessions," i.e., read directions, implement strategies and make selections from the same Web page. Hypertext capabilities allowed the user to access point-of-use assistance, such as search tips and glossary information, by clicking and linking to other web pages. Because the Web is a graphical medium, images were utilized to illustrate and reinforce instructional material.

Samples of the technologies we utilized can be seen by viewing some of the modules already placed on our Information Competence Site.
[http://www.lib.calpoly.edu/infocomp/index.html]

We librarians faced a number of dilemmas when conceptualizing and constructing the tutorials. First of all, we often had difficulty visualizing what the tutorial material would look like once it became a Web document. Second, neither of us had enough experience designing and/or creating web pages to understand fully the technological implications of some of our "storyboard" instructions. That is, we often didn't comprehend what was feasible using html, gif files, frames, etc. We also grappled with the issue of how much explanatory text to include in the instructional sections, as well as how detailed the instruction should be. Moreover, we worried about maintaining consistency between tutorials, in terms of format, navigation and style. Furthermore, though we hoped to take advantage of the Web's hypertext capabilities, we didn't want our users to become disoriented in a maze of clicks and links. And finally, while we chose to incorporate "live" sessions in our tutorials, we were concerned that we might lose our users once they connected to Web pages outside our control.

Once we completed a tutorial "storyboard," we handed it over to the multimedia staff to be placed on the Web. This process will be described in the next section.

STEP 4: MOUNTING THE TUTORIALS ON THE WEB

Transforming the information provided by the librarians to the Web presented many challenges. The process of translating the librarians' text-based material into Web-based tutorials led to many lively discussions. Through trial and error, negotiations, and even compromise, the modules we've worked on so far have undergone many revisions and changes.

The multimedia staff had some experience with content creation for the Web due to the porting of the librarys front-end interface from a Macromedia Director(TM) created,

CD-ROM based tool, to an HTML based Web interface. So, some of the problems of making the leap from Macromedia Director(TM) to the Web had already been recognized and addressed by those in multimedia services.

As mentioned earlier, the librarians provide the multimedia group with a printed layout for each page they want to be included in a module. The multimedia group finds suitable graphics, scans them for electronic distribution, and designs the pages. The librarians then evaluate the preliminary Web pages in terms of layout, graphics, and ease of navigation. The entire information competence team meets to determine if any changes should be made. This meeting gives both groups a chance to discuss the changes from both the content side and the technology side. Oftentimes, the changes that the librarians would like to see made are not practical from a technological point of view.

The librarians, who envisioned using rich graphics without regard to the size of files, something that multimedia software such as Macromedia Director(TM) could easily handle, became aware of the limitations imposed by using the Web as a presentation environment. For example, the Web does not support millions of colors, or sophisticated animation effects. We had to think in terms of kilobyte file sizes, not megabytes because delivery over the Web is too slow to expect users to wait around at your web site for large graphics to appear on their screens.

In order to impress upon the team that we needed to constantly keep in mind the average user of the Web, a 28.8 kbs modem was purchased and attached to one of the computers in multimedia services. This gave the information competence team, used to fast T1 connections, a sense of the transfer technology that most people were using. As we all sat around the computer and modem, and sat, and sat, the team was able to visually, not to mention viscerally, grasp the need to keep file sizes down. This meant that while we could do simple animations using GifBuilder, any attempt to duplicate what we were doing in the Macromedia Director(TM) environment would be unrealistic.

Shockwave(TM) technology, Macromedia's response to this problem, has not yet been implemented for the same reason. Until Shockwave(TM) becomes embedded into the browser software, rather than a plug-in, most people will not use it. The memory requirements that a user must have to effectively view Shockwaved material are more than most computer owners currently have on their systems.

Other problems cropped up from time to time. For example, for one module the "storyboard" we were given made frequent references to "screenshots." Being literal people, we took screenshots of what the librarians had referred to, and spent a lot of time in Adobe Photoshop(TM) manipulating the images to meet the requirements of graphics for the Web. When the content providers saw the mounted pages in Netscape, they realized that what was created was most definitely not what they had envisioned. Rather, they were interested in our creating a "dummy screenshot" that only contained the data they had specified. The need for more meetings was a very positive outgrowth of this particular mistake!

A new concept in browser capability arrived in the spring of 1996, when Netscape announced new HTML tags that allowed for the creation of frames. By the beginning of the new year, we had decided that the frames technology was accepted enough by most users to allow us to utilize it in the creation of our electronic workbooks.

The concept was simple enough to implement. Make a frameset that was spilt horizontally with the workbook being in the bottom one-third of the screen and the instructional section in the top two-thirds of the window. Our first use of this was in module three where the concept of keyword searching was being taught. We made a frameset that had Cal Poly's OPAC, Polycat, in the top, and the workbook in the bottom. As a student read the instructions in the workbook, he/she could respond to the instructions by direct interaction with Polycat in the top screen. This allowed for dynamic, completely "live" instructions to take place. An example of this use of live sessions can be viewed at http://www.lib.calpoly.edu/here_kitty_kitty/lesson01.html

It also meant that to allow for true interactivity a CGI script using the computer language PERL had to be implemented. This way, students could respond to the quizzes and exercises online as well as receive immediate feedback and answers. We are fortunate in that the library has its own web server and the multimedia group has complete access to all the files on it. Server access also allows us to organize the files to best meet our needs, and to make dynamic changes to the pages without any down time.

The Kennedy Library is extremely fortunate to have a full-time staff person dedicated to the creation of multimedia and web-based instructional material. The two grants that the library received in the past few years have also provided the library with the funds to set up and so far, maintain the multimedia working lab.

HARDWARE AND SOFTWARE USED IN DEVELOPING THE TUTORIALS

The hardware and software used for the creation of the instructional modules and presentations described above include:

Hardware:

- Macintosh Power PC (8500)
- Gateway 2000 (Pentium Pro)
- 600 dpi Scanner
- One Color Printer
- One laser Printer
- One QuickTake Digital Camera
- Iomega Zip Drives

Software

- Adobe Photoshop(TM)
  Create, paint, scan and manipulate digital images
- Adobe Illustrator(TM)
  art program for creating images and text.
- Adobe Pagemill(TM)
  an html-based page layout program
- BBEdit(TM)
  Prepares text for electronic transport. Manipulates text into data.
- Microsoft Front Page(TM)
  an html-based page layout program

- Fetch
  Shareware for transferring files
- GifBuilder
  Shareware utility for creating simple, small animations for delivery on the web

CONCLUSION

As you can see from the experiences we have outlined above, Web-based instruction has both intriguing potential as well as intrinsic problems. First, when developing Web instructional modules, the "lowest common denominator" of user equipment and software must be taken into consideration. Not everybody has the most powerful computer and the latest version of Netscape; therefore, not everybody will have access to the fancy bells and whistles being developed. Second, the digital infrastructure available to the user must also be taken into account. Sometimes loading even the most simple Web documents (depending on method of access, time of day, etc.) can be painfully slow and frustrating. Furthermore, while hypertext capabilities provide great instructional opportunities, they also create the potential for confusion, as the user may become lost and disoriented after being led into a maze of clicks and links. Another consideration is the amount of time, money and teamwork involved in developing Web instructional modules. And finally, there is the cost of maintaining and upgrading the product.

On the other hand, there are many advantages of Web-based instruction. First of all, the Web is a newer technology which brings an inherent appeal to students -- its "cool." Second, the graphics capability of the medium allows for the natural incorporation of meaningful and attractive images in the instructional process. In addition, the Web's graphical functionality helps those who master material better through a visual mode of learning. Also to be considered are the hypertext capabilities of the Web which provide exciting opportunities for meaningful point-of-use help (links to glossaries, search tips, etc.). Moreover, hypertext can be used to take advantage of non-linear learning processes. Finally, the Web provides opportunities for utilizing interactive learning exercises and allows for immediate feedback to learners.

When deciding to launch into a project of this magnitude, it is important to commit sufficient time, money, and staff to it. We have been fortunate enough to have acquired adequate funding to get this project off the ground, and we have also been very fortunate in developing good working relationships with one another. We feel that teaching information competence will certainly remain necessary and worthwhile, and that the Web provides another viable instructional medium. Therefore we will continue our efforts to stay current and "cool" in the continually evolving Web universe.

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Transforming CSU Libraries for the 21st Century: A Strategic Plan of the CSU Council of Library Directors. September 23, 1994. California State University, Long Beach, CA.

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